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On the cover:

Scenes of early 20th century fisheries.
Top left: William F. Thompson aboard the
James Carruthers, 1914. Top right: Landing
fish in Seattle, 1915. Bottom: California sardine
catch, 1917. All photos courtesy of the William F.
Thompson papers, Archives, School of Aquatic and
Fishery Sciences, University of Washington, Seattle, Wash.



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William Francis Thompson (1888–1965): a Preeminent Fishery Biologist of the Early and Mid Twentieth Century

J. RICHARD DUNN

William Francis Thompson (Fig. 1) was a major figure in fisheries research on the west coast of the United States in the early and mid 20th century. He came to prominence in an era of increased awareness in the United States

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ABSTRACT—William Francis Thompson (1888–1965) was a preeminent fishery scientist of the early to mid twentieth century. Educated at Stanford University in California (B.A. 1911, Ph.D. 1930), Thompson conducted pioneering research on the Pacific halibut, *Hippoglossus stenolepis*, from 1914 to 1917 for the British Columbia Provincial Fisheries Department. He then directed marine fisheries research for the State of California from 1917 to 1924, was Director of Investigations for the International Fisheries Commission from 1924 to 1939, and Director of the International Pacific Salmon Fisheries Commission from 1937 to 1942. He was also Director of the School of Fisheries, University of Washington, Seattle, from 1930 to 1947. Thompson was the founding director in 1947 of the Fisheries Research Institute at the University of Washington and served in that capacity until his retirement in 1958. He was a dominant figure in fisheries research of the Pacific Northwest and influenced a succession of fishery scientists with his yield-based analysis of fishery stocks, as opposed to studying the fishes' environment. Will Thompson was also a major figure in education, and many of his former students attained leadership positions in fisheries research and administration.

of the need for conservation of wildlife (Trefethen, 1975), and for over 50 years he was a major contributor to fishery science and management as well as to fishery education. During this period Thompson was arguably the most widely known fishery scientist in North America (Anonymous, 1970; Stickney, 1989).

Born in St. Cloud, Minnesota, in 1888, Will Thompson moved west with his family to Everett, Wash., in 1903. He demonstrated an early interest in the study of natural history and majored in zoology at the University of Washington, Seattle, from 1906 to 1909. David Starr Jordan (1851–1931)¹, President of Leland Stanford Jr. University in Palo Alto, Calif., learned of Thompson's drive and dedication. Jordan offered Thompson a scholarship, and in 1909 Thompson transferred from the University of Washington to Stanford University where he became a research assistant to Jordan. Thompson graduated with a B.A. degree in zoology in 1911² and published ten papers on the taxonomy of marine fishes during 1910–14, mainly as junior author with Jordan (Dunn, 2001a).

Pursuing graduate work at Stanford University in the fall of 1911, Thompson

¹ Jordan was the preeminent ichthyologist of North America and supervised the work of many students who subsequently became leaders in ichthyology and fishery science. His autobiography (Jordan, 1922) provides a treasure of information on the history of ichthyology and early fishery science. Additional information on the history of ichthyology is given by Pietsch and Anderson (1997).

² Thompson received his Ph.D. degree in 1930 from Stanford University (Anonymous, 1931). Additional information concerning ichthyology and fishery science at that institution is given by Brittan (1997).



Figure 1.—William F. Thompson at Stanford University, May 1913. Source: Photograph No. 444 from the William F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington, Seattle.

son came under the influence of Charles Henry Gilbert (1859–1928), a zoology professor and eminent early fishery biologist.³ Gilbert thought highly of Thompson and arranged jobs for him during the summers between university semesters, first with the California Fish and Game Commission (1911) and then with the British Columbia Provincial Fisheries Department of Canada (1912–13). These assignments entailed surveys of shellfish resources (Dunn, 2001a).

Excelling in these studies, Thompson was then entrusted by the Provincial Fisheries Department to undertake a comprehensive, full-time investigation of the Pacific halibut, *Hippoglossus stenolepis*, in British Columbia. Thompson conducted an intensive study of this species from 1914 to 1917 and published the results in seven landmark papers (Dunn, 2001a).

In 1917 research on the halibut began to wind down as concern intensified in Canada over the ravages of World War I. Thompson was then hired by the California Fish and Game Commission to investigate that state's marine fisheries. While there, he helped found, and direct, the Commission's first marine fisheries research laboratory. Thompson focused his investigations initially on the albacore tuna, *Thunnus alalunga*, and then on the Pacific sardine, *Sardinops sagax*, as the commercial harvest of this latter species began to increase (Dunn, 2001b).⁴

The International Fisheries Commission (now the International Pacific Halibut Commission) was established in 1923 by treaty between the United States and Canada to investigate and regulate the fishery for Pacific halibut.⁵ Thompson, the logical choice, was appointed Director of Investigations for the newly formed Commission, left California, and began his work for the

³ Gilbert subsequently became famous for his pioneering studies of the life history of Pacific salmon. More information on Gilbert is given by Dunn (1997).

⁴ Smith (1994) described some of Thompson's scientific contributions made in California.

⁵ Information on the background and origins of the International Pacific Halibut Commission is given in Anonymous (1978) and at the Commission's web site: <http://www.iphc.washington.edu/halcom/default.htm>. Further information about the Commission is contained in Bell (1981), and Gilbert (1988).

Commission in Seattle in 1925. Expanding his earlier Pacific halibut studies, he engaged a small staff of scientists that undertook the applied research necessary for the scientific management of the halibut fishery. Thompson remained as Director of Investigations for the Commission until 1939. During his tenure halibut abundance increased, as did the commercial harvest. The halibut fishery ultimately was considered a model of a well-managed fishery.^{6,7}

Thompson was appointed Director of the School of Fisheries (now the School of Aquatic and Fishery Sciences), University of Washington, in 1930. This appointment was initially a part-time position in addition to his duties at the International Fisheries Commission (Stickney, 1989).

The International Pacific Salmon Fisheries Commission was established in 1937 to restore the sockeye salmon, *Oncorhynchus nerka*, runs of the Fraser River, British Columbia (Roos [1991]). Thompson, by then recognized as one of the premier fishery scientists of the era, was chosen to be the director of this newly formed organization (Roos

[1991]). He initially retained his other positions as Director of the "Halibut Commission" and of the U.W. School of Fisheries, thus holding three jobs simultaneously!⁸ Thompson followed his previous approach to fisheries research by building a small but talented staff of scientists and broadly attacking a wide range of research projects pertinent to the current fisheries problems. He directed the research that resulted in the construction of fish ladders at Hell's Gate on the Fraser River. These ladders were built to enable salmon to bypass migration obstructions caused by certain high water-level conditions.⁹ Thompson and the Commission were generally credited with restoring the abundance of salmon in the Fraser River.^{10, 11} He resigned from the "Salmon Commission" in 1942 and returned to the University of Washington as the full-time Director of the School of Fisheries.

Thompson was the Director of the School of Fisheries for over 17 years (1930–1947). During his tenure, the school developed into a preeminent facility to train fishery scientists, and it graduated many individuals who subsequently became prominent fishery scientists and leaders in fisheries research and administration (Stickney, 1989).¹²

After the close of World War II, the salmon packers of Bristol Bay, Alaska,

⁶ Several authors have given plaudits to the management of the Pacific halibut and, either directly or by implication, to Thompson's role in this effort. Bevan (1965) wrote: "The work of the Pacific Halibut Fisheries Commission provides an outstanding example of successful regulation by means of a quota. The commission's regulation has resulted in virtually full rebuilding of halibut stocks of the North Pacific." Crutchfield (1965) commented: "The halibut programme has been a conspicuous success—from a biological standpoint." Parsons (1993) noted: "W. F. Thompson, the first director of the Halibut Commission, identified a relationship between catcher-unit-of-effort and the amount of fishing effort (Thompson and Bell, 1934). This led him to suggest that some restrictions of fishing effort would improve the state of the halibut stocks. Some management measures were taken by the Halibut Commission and the halibut stocks increased in abundance. There was later controversy about the extent to which this was due to the appearance of a strong year-class at the same time the measures were introduced." Scheiber (1994) wrote that "...which – on the basis of Thompson's investigations of the causes of halibut depletion – instituted a halibut fishing regime that was widely regarded as being responsible for engineering the recovery to commercially viable levels of a fishery that had nearly died out from uncontrolled over-harvesting on a virtually slash-and-burn basis."

⁷ Other possible interpretations of the causes of the recovery of halibut stocks, other than management actions, are reviewed by Skud (1975) and Smith (1994).

⁸ Thompson resigned as Director of the International Fisheries Commission in 1939.

⁹ Further information on the International Pacific Salmon Fisheries Commission is given by Roos [1991] and Gilbert (1988).

¹⁰ Van Cleve (1966) wrote about Thompson: "He inaugurated an intensive investigation of the effect of the varying water levels at Hell's Gate in the Fraser River Canyon, and found that the block to migrating sockeye, created by a land slide in 1912, was still effective at certain river levels. This study resulted in the construction of the Hell's Gate fishways which, with subsequent additions to provide passage at higher and lower water levels, made possible the restoration of the sockeye salmon runs in the upper Fraser River." Roos [1991] wrote the following about Thompson: "His findings with regard to Hell's Gate published as the first Commission Bulletin set the course for the Commission's restoration of Fraser River sockeye and pink [O. gorbuscha] salmon stocks."

¹¹ Evenden (2000) described Thompson's role in building the Hell's Gate fishways and the attendant controversy about their need.

¹² A brief history of the School of Fisheries compiled by the author is available on the website of the School of Aquatic and Fishery Sciences [<http://www.fish.washington.edu/history/>].

became concerned about the declining abundance of salmon in Alaska. In 1945 they asked Thompson to undertake a preliminary study of the situation and to make recommendations for action. Thompson visited Bristol Bay, reviewed much of the available data on the salmon fisheries of the region, and wrote a report to the packers.¹³ He called for long-term studies of the runs to various watersheds of Bristol Bay and noted that such investigations were then lacking. The salmon packers funded an expanded investigation by Thompson in 1946 and 1947. The salmon cannery owners of southeastern Alaska soon thereafter asked that Thompson also undertake scientific investigations in that region (Stickney, 1989).

Realizing that a comprehensive investigation of salmon in Alaska would ultimately require a relatively large organization, Thompson organized the Fisheries Research Institute at the University of Washington. The university's Board of Regents approved the institute in 1947 and placed it administratively in the Graduate School and therefore distinct from the School of Fisheries. Thompson resigned the directorship of the School of Fisheries in 1947 and was named Research Professor and Director of the new institute (Stickney, 1989).

Over the years The Fisheries Research Institute undertook detailed studies of Pacific salmon in various areas of southeastern, central, and western Alaska. In the early years, this research was funded mainly by the Alaska salmon industry. Later, the Federal Government provided major support for these studies. The institute, well known for the high quality of its research (Stickney, 1989)¹⁴, made major contributions over a 50-year period to knowledge of Pacific salmon biology. During the early part of this era, Thompson became the "expert" on salmon of Alaska and the Pacific Northwest, and he was involved in most aspects of salmon research (Fig. 2). Thompson maintained close relations with the Alaska salmon

¹³ Stickney (1989) discussed Thompson's initial report to the salmon industry.

¹⁴ A history of the Fisheries Research Institute is on the School of Aquatic and Fishery Sciences web site at [<http://www.fish.washington.edu/research/alaska/history.html>].



Figure 2.—William F. Thompson, ca. 1951. Courtesy, Archives of the University of Washington Libraries, Seattle. William F. Thompson papers, Accession Number 2597-77-1, Folder 39.

industry that, in turn, respected and trusted him. He generally received broad support from industry and government for his research.

Thompson retired from the directorship of the Fisheries Research Institute in 1958 at the age of 70. He remained active as a consultant to various fishery agencies, including the Bureau of Commercial Fisheries (now the National Marine Fisheries Service), the International North Pacific Fisheries Commission, and the U.S. Army Corps of Engineers. Thompson also remained close to the salmon fishing industry as an advisor. Many scientists and administrators held him in high esteem and welcomed his honest and forthright comments and criticism.

Will Thompson died on 7 November 1965 (Van Cleve, 1966). He left a legacy as a preeminent fishery scientist of his

era. He influenced a myriad of fishery scientists by studying the characteristics of the fisheries, rather than the environment, to develop management strategies (Kendall and Duker, 1998). Thompson's work with the halibut and salmon of the Pacific Northwest and Alaska became classic, but at times controversial, studies of commercial fisheries (Fig. 3).¹⁵ He published about 150 scientific papers and was known for his original studies of population dynamics of commercial fishes.

Under Thompson's leadership, the School of Fisheries at the University of Washington became world-renowned. He was the doctoral advisor for many of the principal scientists who carried out

¹⁵ Additional information on Thompson's impact on fishery science is given by Smith (1994) and Kendall and Duker (1998).

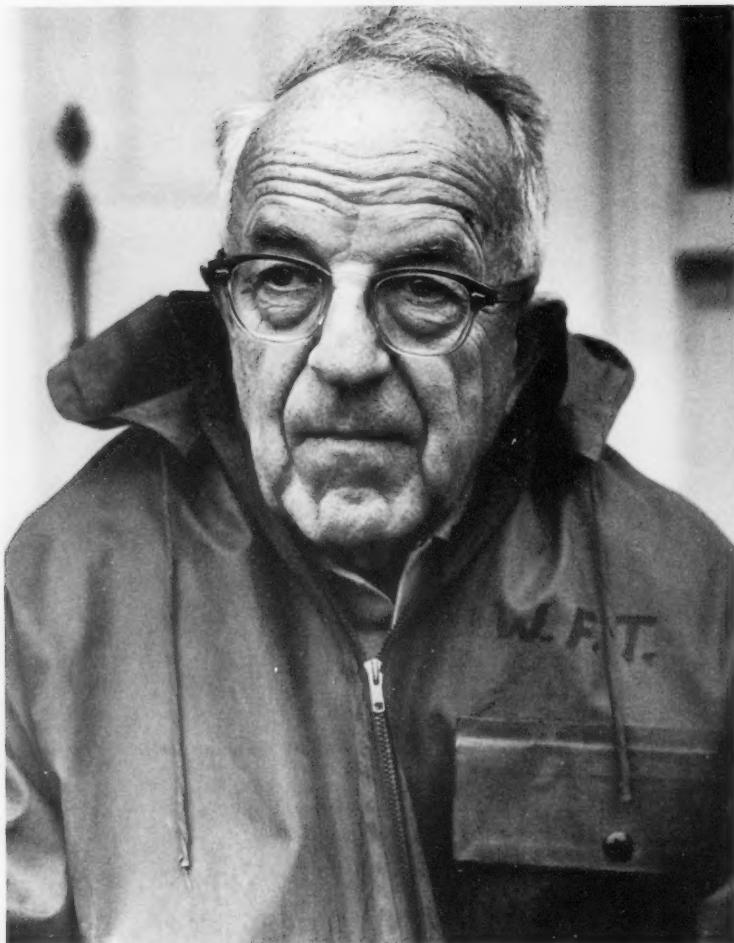


Figure 3.—William F. Thompson, 1964. Photograph by Josef Scaylea, Seattle. Courtesy, Josef Scaylea, The Seattle Gallery, and the Archives, School of Aquatic and Fishery Sciences, University of Washington, Seattle.

fishery work on the Pacific coast after World War II. He was also the major fishery researcher on the West Coast during the interlude between the two World Wars (Scheiber, 1994). Thompson was known as a highly focused individual and an intense worker who, at times, was possessed of a difficult personality (Stickney, 1989).

Always possessing a high concern for ethics, Thompson helped found the American Institute of Fishery Research Biologists in 1956 to insure high standards in the profession. Thompson's

pioneering accomplishments remain in high esteem today.

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William Francis Thompson (1888–1965) and His Pioneering Studies of the Pacific Halibut, *Hippoglossus stenolepis*

J. RICHARD DUNN

Introduction

William Francis Thompson (1888–1965) was born in Minnesota but moved in 1903 with his parents to Everett, Wash., where his father, Pirrie, worked for the Great Northern Railway. Will attended local schools and demonstrated an early interest in natural history. He entered the University of Washington, Seattle, in 1906 and majored in zoology.¹ Thompson impressed his professors with his work habits, and his diligence was noticed in 1909 by a visiting professor from Leland Stanford Junior University in Palo Alto, California, Edwin Chapin Starks (1867–1932).^{2,3} Soon thereafter Thompson received an offer to work

for David Starr Jordan (1851–1931), then the leading ichthyologist of the United States as well as the President of Stanford University.^{4,5} During the early part of the 20th century, Stanford University was the center of research on fishes in the United States (Brittan, 1997). Thompson therefore transferred from the University of Washington to Stanford University in 1909 where he continued his studies in zoology.

As an undergraduate student, Thompson assisted Jordan in his study of the taxonomy and distribution of fishes and, in the process, co-authored a series

of publications with him. Thompson graduated from Stanford University in 1911 with a B.A. degree in zoology. One of Thompson's professors at Stanford University was Charles Henry Gilbert (1859–1928), the Chairman of the Department of Zoology (Brittan, 1997; Dunn, 1997). Thompson studied ichthyology under Gilbert and was exposed to Gilbert's critical thinking and fine eye for detail. Remaining at Stanford University, Thompson began his graduate work under Gilbert in the fall of 1911, continuing through 1913, and was thus introduced by Gilbert to the then newly developing field of fishery biology.⁶

Gilbert was a compulsive worker, and was strongly impressed by Thompson's hard work and dedication to the task at hand.⁷ Thompson's first field experience

¹ Information about Thompson's early life is contained in an unpublished family memoir: Thompson, J. B. [Editor, dated July 1, 1925–July 1, 1972]. "Thompson: a family history," unpaginated, but ca 372 p. A photocopy of this manuscript has been deposited in the W. F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington. Hereafter referred to as J. B. Thompson, manuscr. (The volume and page numbers referred to in this paper are those that I added to my photocopy of the manuscript; the original is variously paginated).

² At the University of Washington, Thompson's mentor was Trevor Charles Digby Kincaid (1872–1970), a Professor of Zoology who was a principal in creating the University of Washington's marine biology station at Friday Harbor, Wash. (Pietsch, 1997).

³ Starks was a visiting professor conducting research at the Friday Harbor station in 1909 where Thompson was a summer student assistant (J. B. Thompson, manuscr., I:68). Additional information about Starks is given by McFarland (1933) and Pietsch (1997).

⁴ Jordan was mentor to many of the prominent ichthyologists of the era. His autobiography (Jordan, 1922) offers insight into the era of exploration of fish and fisheries of the early 20th century. Further information about Jordan is given by Myers (1951) and Brittan (1997).

⁵ Thompson received a wire from Professor Starks in August 1909 offering him a position as an assistant to Dr. Jordan. The wire concluded, "Come as soon as possible." J. B. Thompson, manuscr. 1:66 (see footnote 1).

⁶ Thompson wrote that his knowledge of fisheries science, as a study of the effect of commercial and sport fishing on fish populations, was obtained in seminars at Stanford University and through reading the reports of the great European investigators such as Johan Hjort, D'Arcy Wentworth Thompson, and others (J. B. Thompson, manuscr. II:8, see footnote 1). Johan Hjort (1869–1948) was a Norwegian biologist who became an important figure in fisheries of the first half of the 20th century. He was a founder of the International Council for the Exploration of the Sea, a major fisheries coordinating agency in Europe (Kendall and Duker, 1998). D'Arcy Thompson (1860–1948) was an internationally acclaimed professor at St. Andrews College in Scotland. He had a broad knowledge of natural history, the classics, and oceanography, but was best known to biologists for his application of mathematics to biology. His book *On Growth and Form* (D. Thompson, 1917) is a classic of the period (Gillispie, 1976).

⁷ Gilbert wrote in early 1910 to John Pease Babcock (1855–1936), then with the California Fish and Game Commission, indicating that he had a new student by the name of Thompson who looked very promising: "He is an indefatigable worker and cares for little else...." Gilbert to *continued*

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ABSTRACT—William Francis Thompson (1888–1965), as a temporary employee of the British Columbia Provincial Fisheries Department, was assigned in 1914 to undertake full-time studies of the Pacific halibut, *Hippoglossus stenolepis*. The fishery was showing signs of depletion, so Thompson undertook the inquiry into this resource, the first intensive study on the Pacific halibut. Three years later, Thompson, working alone, had provided a basic foundation of knowledge for the subsequent management of this resource. He published seven landmark papers on this species, and this work marked the first phase of a career in fisheries science that was to last nearly 50 years.

in fisheries biology occurred during the summer of 1911 when he surveyed clam beds in California for that state's Fish and Game Commission (Van Cleve, 1966).⁸

This paper describes Thompson's early years as a fishery biologist.⁹ He conducted the first comprehensive studies of the Pacific halibut, *Hippoglossus stenolepis*, and laid the scientific foundation for the subsequent management of this resource in the 1930's by the International Fisheries Commission (now the International Pacific Halibut Commission), which he then directed.¹⁰ These initial studies by Thompson marked the beginning of a 50-year career in which he became the most widely known fishery scientist and educator of the Pacific Northwest (Dunn, 2001a).

⁷ (continued) Babcock, dated Stanford University, 10 January 1910, British Columbia Archives and Records Service, Group 435, Box 198, Folder 1909. Babcock became an important contact in the fisheries field to both Gilbert and Thompson. Babcock was the Commissioner of Fisheries for the Province of British Columbia from 1901–1906. He was then Deputy Commissioner from 1907 to 1909 and, later, Assistant Commissioner (1912–35). He was with the California State Board of Fish Commissioners from 1891 to 1901 and from 1910 to 1911. A brief biography of Babcock is present in the Babcock papers, Manuscripts, Special Collections, and University Archives, University of Washington Libraries (hereafter University of Washington Archives), Accession No. 860-1, Box 1. An obituary of Babcock may be found in the *Victoria Daily Times*, 13 October 1936. For more on Babcock, see Gilbert (1988) and Dunn (1996).

⁸ Thompson was hired by Babcock, then Chief Deputy to the Board of the Fish and Game Commissioners of California, to survey the abundance and distribution of Pismo clams, *Tivela stultorum*, in northern California. Thompson's field diary for his clam surveys of 1911 is present in the files of the International Pacific Halibut Commission, Seattle, Wash. See also J. B. Thompson, manuscr. I:72–73 (see footnote 1).

⁹ Elmer Higgins (1934) was likely the first person to define the term "fishery biologist" and to articulate its aims and methods, with an emphasis on a quantitative approach to the fisheries.

¹⁰ The International Fisheries Commission was established in 1923 by treaty between the United States and Canada. The Commission was organized to conduct research on the halibut and to regulate the fishery to provide the necessary management of the resource (Anonymous, 1978). It represented the first international attempt to conserve and replenish a marine fishery (Skud, 1973). The Commission's first Director was William Francis Thompson. The Commission was renamed the International Pacific Halibut Commission in 1953. For additional information on the establishment of the Commission, see Bell (1981) and Gilbert (1988).

The sources for the information presented here include Thompson's published works as well as other pertinent publications, his personal papers in the archives of the University of Washington Libraries, and records in the archives of the School of Aquatic and Fishery Sciences, University of Washington. Additional documents were examined from the Stanford University Libraries, Stanford, Calif., the British Columbia Archives and Records Service, Victoria, B.C., Can., and from the files of the International Pacific Halibut Commission, Seattle.

Thompson Joins the British Columbia Provincial Fisheries Department

In the early 20th century, concern over the depletion of the game animals and sport and commercial fishes was increasing. Human populations in the western United States were growing, and the visions of an earlier era of a vast abundance of fish and other wildlife were becoming mere reflections of the past. Rapidly dwindling populations of wildlife generated an interest in their preservation, which led to the acceleration of the American conservation movement (Reiger, 1975).

Knowledge of the fishery resources of British Columbia in the early 20th century was woefully inadequate for management of the stocks. The *Report of the Commissioner of Fisheries for the Province of British Columbia for the year ending December 31st, 1913* (Anonymous, 1914) stated:

"The growing future of the fisheries of British Columbia, which everything portends, accentuates the need for fuller investigation of the habits and distribution of the food-fishes of the Coast. No attempts on any worthy scale have as yet been made in this direction and aside from the investigations conducted by the Department in the past few years, the result of which have been given to the public in the annual reports, there is but scanty literature dealing with this very important subject."

This same report (Anonymous, 1914) called for particular attention to be directed at the Pacific halibut:

"In the case of the halibut, prediction is made that the fishery will be depleted, although the success of the catch in recent years would not seem to warrant this. Immediate study should be given to its life-history, however, in order that protective or other measures be taken to conserve it."

In an attempt to remedy this lack of knowledge, John Babcock, the Assistant Commissioner of Fisheries for the Province of British Columbia, turned to Stanford University in 1912 and hired its preeminent fishery scientist, Professor Charles Gilbert, as a temporary employee to investigate the salmon resources of the Province. Babcock had just returned to the British Columbia Provincial Fisheries Department after a short stay (1910–1911) in California with that state's fisheries agency (Dunn, 1996). Gilbert hired Thompson as his assistant.¹¹ Because of Thompson's experience in 1911 inventorying clams in California, Babcock asked him to survey the shellfish resources of British Columbia. This initial work by Thompson was conducted in the summers of 1912 and 1913, while he was a graduate student at Stanford University, and quickly resulted in two publications on the shellfish of the Province (Thompson, 1914a, b).¹²

In 1914 Babcock asked Gilbert to undertake a survey of the British Columbia halibut fishery. Gilbert, in turn, suggested that Thompson undertake the work "under my instruction."¹³ The

¹¹ Babcock was pleased that Thompson was available for work "this summer" and offered him a job to study shellfish for \$75 a month and expenses from and to Stanford University. Babcock wanted Thompson to begin work on 15 May 1912. Babcock to Thompson, dated Victoria, 25 April 1912. Letter is copied to C. H. Gilbert, University of Washington Archives, Accession Number 2597-77-1, Box 12, Folder 4.

¹² Thompson's field diaries for the years 1912 and 1913 are present in the files of the International Pacific Halibut Commission, Seattle, Wash.

¹³ I was unable to locate any correspondence in which Babcock specifically asked Gilbert to investigate the halibut. However, letters from Gilbert to Babcock that discussed the subject are present, e.g., Gilbert to Babcock, dated Stanford University, 18 March 1914: "I am greatly pleased that you are to utilize Thompson this coming year. He will accept and will be most useful."

continued

Department then hired Thompson as a temporary employee, and he duly began to study the halibut.¹⁴ As noted in the Annual Report of the Commission, "The first systematic attempt to trace the life-history of the halibut was inaugurated by the Department when W. F. Thompson was assigned the work" (Anonymous, 1915). The report further noted that Thompson "started actively the collection of specimens on a scale never before attempted" (Anonymous, 1915).¹⁵

For Thompson, the halibut investigation became a full-time, but still temporary, job with the Department.¹⁶ The Commissioner's Report for 1914 stated, "The impossibility of dealing with a subject of this scope in the short summer months was recognized by the Department, and Mr. Thompson was detailed to give his entire time to the problem" (Anonymous, 1915). Thompson was to be employed on a year-round basis at a salary of \$100 per month plus expenses.¹⁷ He again received high

praise from Gilbert for his industriousness, with the latter writing to Babcock: "He is certainly an engine to work and will improve in finish."¹⁸

The halibut fishery was then relatively young, being developed by Canadian and United States fishermen, but one whose stocks appeared to be declining in abundance. Thompson noted that the supply of halibut might have been in danger as the best-known halibut banks were becoming seriously depleted. Each season the catches were obtained from more distant banks, and it became evident that the supply was limited and rapidly decreasing. Hence, if this source of food was to be maintained, some protection of the resource appeared to be necessary. Before any protection could be extended to this important resource, knowledge of the life history of the halibut was required and, at that time, little such information was available (Thompson, 1915).

Depletion of deep-sea fisheries had previously been argued, but never widely accepted as fact.¹⁹ During his work on the halibut from 1914 to 1917, Thompson demonstrated the reality and extent of the depletion of the fishery and made recommendations for its restoration. According to Van Cleve (1966), Thompson "not only demonstrated his ability for independent thinking but also revealed his training in meticulous observation and careful measurement that he had learned so well from Professor Charles H. Gilbert. So successful was Thompson's work that the fishery was

¹³ (continued) British Columbia Archives and Records Center, hereafter British Columbia Archives, Group 435, Box 56, Folder 509. Gilbert to Babcock, dated Stanford University, 8 April 1914: "I believe it is important to push the halibut investigation, but do not see how I can carry it very far this year. What would you think of putting Thompson on that work this summer, under my instructions? He could pretty well clean that up in the year, besides finishing the shell-fish survey and getting me the fall salmon material which I need. He will do much better if he be given definite tasks, or rather definite subjects for investigation. The halibut job will be a big one and will require continued work on the halibut banks, so the fish are all eviscerated there." British Columbia Archives, Group 435, Box 56, Folder 509.

¹⁴ Thompson's field diaries for the years 1914–16 and for part of 1917 are present in the files of the International Pacific Halibut Commission, Seattle, Wash.

¹⁵ When Thompson began his studies (Thompson, 1915), virtually nothing had been published on the life history of the Pacific halibut.

¹⁶ Thompson wrote later that undertaking the halibut study was the major turning point of his career. He apparently discussed the halibut project with his fellow graduate students at Stanford University who, according to Thompson, considered the task too difficult to undertake, e.g. "who could study a fish a hundred fathoms deep in the ocean, without even a vessel?" Thompson then wrote "So I promptly got off the 'bandwagon' of the most popular and overcrowded fields of endeavor and into a very new one where I was alone on the ground floor." J. B. Thompson, manuscr. III:68–69 (see footnote 1).

¹⁷ Records show that Thompson was paid \$75.00 for July 1912. Schedule D, Salaries of

continued

to reach near-optimum productivity in later years."

Thompson's plan of study of the halibut included four elements, based on the research approach used in the North Sea. According to some of his later writings, Thompson's first objective was the collection of statistical data from the fishery to measure "catch-per-unit-of-effort." Second was to attempt to measure "racial" differences among the stocks; third was to determine the history of the fishery, its expansion and then depletion; and, finally, the use of age determination to develop population parameters. Thompson was able to immediately implement some, but not all, of these approaches. He later claimed that his study of catch-per-unit-of-effort and his examination of the history of the fishery to detect depletion were the first such studies to be applied to an American fishery (Van Cleve, 1966).^{20,21}

In May 1914 Thompson began a detailed study of the life history of the Pacific halibut. He made many trips aboard halibut fishing vessels in Canadian waters and as far west as Kodiak Island, Alaska. Thompson's basic approach was to collect information on age and growth, length and weight, and sex and maturity of halibut and to determine the variation present in these parameters.²² Additionally, he was interested in the timing, duration, and location of the halibut spawning season. He therefore investigated the fecundity of the species by studying the number, size, and maturity of ova produced by female halibut. Thompson also determined the age at which the fish matured. The food of the halibut was investigated, and notes were made on halibut parasites and

¹⁷ (continued) Staff for Month of July 1912, Government of British Columbia. British Columbia Archives, Group 435, Box 86, Folder 818. His salary was increased for 1914. See Night Telegram from D. N. McIntyre, Deputy Commissioner of Fisheries [n.d., marked in pen 1913] to W. F. Thompson, c/o Dr. Gilbert, Stanford University, Calif.: "As instructed by Commissioner to offer you year's engagement at hundred month and traveling expenses to continue clam investigations and such other field work as may be desired by department." British Columbia Archives, Group 435, Box 93, Folder 911.

¹⁸ Gilbert to Babcock, dated Stanford University, 30 October 1914. "Thompson is here hard at work on otoliths and scales. He is certainly an engine to work and will improve in finish." British Columbia Archives, Group 435, Box 56, Folder 511.

¹⁹ A history of the early arguments about the depletion of sea fisheries is given by Smith (1994).

²⁰ Thompson and Freeman (1930) wrote a history of the halibut fishery. For a more recent summary of the fishery, see Bell (1981).

²¹ J. B. Thompson, manuscr. III:69–70 (see footnote 1).

²² During his field seasons, Thompson corresponded with Gilbert, who offered suggestions to Thompson about lines of inquiry to pursue. As an example, in the summer of 1914 Gilbert advised Thompson on research methods and concluded with a word of praise, "It is a fascinating problem and I do not know anyone else who is so likely to work it out in an exhaustive and trustworthy fashion." Gilbert to Thompson, dated Victoria, 28 July 1914, University of Washington Archives, Accession Number 2597-77-1, Box 1, Folder 51.



Figure 1.—William F. Thompson, Sidney Island, B.C., 1912. Source: William F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington, Seattle.

potential predators. The initial results of this research were published in 1915 (Thompson, 1915).

Thompson first looked for scientific as opposed to anecdotal evidence of depletion in the halibut stocks. During his numerous trips aboard halibut schooners, he quickly became aware of the ship's logs and the careful manner in which masters and mates of the vessels maintained catch and location records. He obtained the trust of the vessel captains and was allowed to examine ship's logs for over 900 halibut fishing voyages taken from about 1902 to 1915.²³ These records provided the data for his analyses of Pacific halibut catches and offered valuable insight into the condition of the fishery (Thompson, 1916a).

²³ "Captain Freeman says he has log and tally sheets for ten years back ... I am to remind him to get them when we get ashore." W. F. Thompson diary 5 March 1915 (aboard the *S. S. Flamingo*). "I am copying his log as fast as I get an opportunity." W. F. Thompson diary 13 March 1915. Files, International Pacific Halibut Commission, Seattle, Wash.

Thompson spent many days at sea aboard halibut boats to collect data from the catches (Fig. 1-5).²⁴ The boats were small and cramped, the weather was often uncooperative, and Thompson found the general conditions quite uncomfortable. As he noted in his first halibut report (Thompson, 1915):

"The work concerning which this preliminary report is issued was begun in May, 1914, when the first trip to the fishing-grounds was made. Since then numerous trips have been made to various banks,

²⁴ Thompson spent much of 1914 and 1915 at sea collecting data. For example, he was aboard the halibut schooner *James Carruthers* in June and September 1914, the *S. S. Kelly* in July and August 1914, and the *Flamingo* in March 1915. He returned to Stanford University in early April, but was on the *Chief Skugard* from mid July to mid August 1915. A winter trip aboard the *Flamingo* was made in December 1915 and early the following January. He then boarded the *Andrew Kelly* in mid January 1916. J. B. Thompson, manuscr. II:1-26, (see footnote 1). See also the W. F. Thompson diaries for 1914-16, International Pacific Halibut Commission, Seattle, Wash.

especially to those fished by vessels from Canadian ports."

The work was arduous and potentially dangerous (Thompson, 1915):

"The fish were examined on the deck as they were brought in. The decks were always so slippery and slimy that it was necessary to lash the fish down 'fore and aft' to guard against the rolling movements of the vessels as they lay in the trough of the seas. Also, of course, the place chosen to work on could not be in the way of the fishermen at their work, and it was, therefore, necessarily distant from the 'checkers' or pens of fish, despite the difficulty of handling heavy fish on a slippery deck. Care was likewise necessary that no cuts were made which could injure the market value of the fish. As a result of these conditions it was possible to examine less than a hundred fish in a day, save in exceptional cases



Figure 2.—William F. Thompson (right) aboard the halibut fishing vessel *Flamingo* in 1915. Source: William F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington, Seattle.

where the fish were small. It need only be said that accurate work under such conditions was time consuming."

When not sampling or conducting other work on the vessels, Thompson wrote frequent letters to his friend, a fellow graduate student at Stanford University and soon to be wife, Julia Bell Shands (1884–1976).²⁵ In addition to explaining to Julia his work on the boats, Thompson described the often difficult conditions he faced, particularly in the winter. Aboard the *Andrew Kelly* in January 1916 he wrote about the cold and the living conditions aboard the vessels. After describing the snow, wind squalls, and icing, Thompson wrote:

"Every window is tightly closed, all the ventilators are choked with something, the hatches are battened down and frozen so, and all the doors are closed. The air is atrociously bad and fetid, but even then cold, except in the pilothouse. There the skipper, clad in his great "doffer" and sea-cap, peers out through a half opened window, because the glass is all sheeted with ice. In sheer need for a clean breath I have come up here, when it is cold, to write."²⁶

Much of Thompson's work was published in the *Province of British Columbia Report of the Commissioner of Fisheries for the year ending December 31st, 1915*.²⁷ Three of his papers appeared in that volume.²⁸ The first paper was a lengthy analysis of the statistics of the halibut fishery, a culmination

²⁵ Thompson to J. B. Thompson, dated Petersburg, Alaska, 21 January 1916. J. B. Thompson, manuscr. II:37 (see footnote 1). Thompson narrowly escaped death in January 1916. He was scheduled to board the halibut schooner *Onward Ho* out of Prince Rupert, B.C., to sample the halibut catches. However, delays in completing his research reports caused him to miss the sailing. Instead Thompson took the vessel *Andrew Kelley* for his work. The *Onward Ho* disappeared in mid-January during a violent storm and no remnants of the vessel were ever found. All aboard the vessel perished (summary by William Francis Thompson, Jr., dated 12 October 1973, *In J. B. Thompson*, manuscr. II:145b (see footnote 1)).

²⁶ Thompson received high praise from Gilbert for his publications on halibut. "I am in receipt of your Report for 1914 and want to congratulate you on its excellent form and on the showing made of the activities of the Department. I venture the assertion that it packs within comparatively small compass more valuable contributions to the scientific and economic advancement of our fisheries industry, than does any other government publication in America, not to carry our comparison farther afield. The most valuable single contribution, marked by the novelty of the results, the thoroughness of its methods, and its finished form—is Thompson's paper on the Halibut. Making all allowance for the fact that he had a virgin field to cultivate, the fact remains that he achieved most valuable results in the face of difficulties which would have appalled most men." Gilbert to Babcock, dated Stanford University, 3 November 1915, British Columbia Archives, Group 435, Box 105, Folder 1045.

²⁷ Thompson's third paper, published in 1916, dealt with a parasite that caused "mushy" halibut (Thompson, 1916b).

²⁸ Julia Bell Shands was born in San Marcos, Texas. She met Will Thompson in 1914 at Stanford University where she was seeking a Master's Degree in English. They were married in San Marcos on 26 September 1915. The couple had four children, two boys and two girls. J. B. Thompson, manuscr. I:95–117 (see footnote 1); Anonymous (1970).



Figure 3.—Coiling longline fishing gear aboard the vessel *James Carruthers*, 1914. Source: William F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington, Seattle.

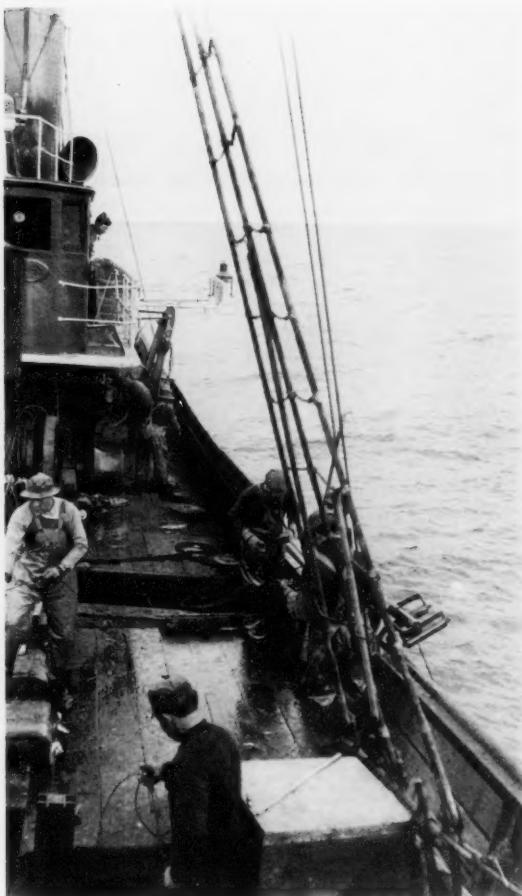


Figure 4.—Long-lining aboard the vessel *James Carruthers*, 1914. Source: William F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington, Seattle.

of Thompson's research through 1915 (Anonymous, 1916; Thompson, 1916a). He concluded that the area where the most intensive fishing occurred during this period shifted yearly to a greater distance from shore and also farther to the north; the fishing likewise shifted to deeper water in the winter months.²⁹ The length of the voyages and the time fished increased, indicating depletion of stocks. Additionally, the weight of halibut caught per skate (i.e. the catch-per-unit-of-effort or the weight of fish

caught per unit of fishing gear) on all fishing grounds declined by a factor of more than four.³⁰ The number of fish caught per skate declined by a factor of 3.5–4. Furthermore, the average weight of fish caught declined markedly over time. Moreover, banks nearest the open ocean seemed to yield smaller fish than the more protected banks or enclosed waters. Finally, relatively small yields

composed of large fish indicated declining productivity; these statistics characterized the banks that had been most recently exploited. These factors together strongly suggested a resource being depleted.

Thompson also published a general summary titled "The Problem of the Halibut" (Thompson, 1916c). In this paper he reviewed the status of knowledge and methods of the halibut fishery, and presented evidence that suggested the stocks were declining (Fig. 6–8). Thompson called for additional study of the resource, particularly an investigation of the spawning habits, migrations,

²⁹ Subsequent studies showed that the halibut underwent a winter spawning migration to deeper water (Anonymous, 1978).

³⁰ A "skate" is a unit of halibut fishing gear consisting of lines with baited hooks. During Thompson's investigations, a skate consisted of 8 lines of 50 fathoms each with about 32 hooks per line (Thompson, 1916a). More on halibut fishing gear is given by Bell (1981).

and population structure of the species. Such data were needed, he argued, before a rational plan could be assembled to reverse the decline in yield.

The reports published by Thompson in 1916 provided dramatic evidence of depletion of the halibut fishery, in contrast to a report published by Professor Arthur Willey shortly before Thompson's paper was disseminated.³¹ Willey expressed doubts as to the decline of the halibut fishery, and he further suggested that limitation of the industry was not needed (Willey, 1916). Thompson addressed Willey's paper in a footnote, noting that the scientific basis for Willey's conclusions were very weak (Thompson, 1916a).³²

Steps were initiated by the United States and Canada to regulate the halibut fishery. The U.S. Senate passed a measure in 1916 (Senate Bill 4586) to establish a closed season on halibut between December and January of each year and also to establish a closed zone of some 200 square miles off British Columbia and in the Gulf of Alaska. Enforcement of the proposed regulations was contingent upon the enactment of similar laws by the Canadian government. The bill failed to pass in the U.S. House of Representatives, and therefore the proposed law was not implemented (Anonymous, 1917; Gilbert, 1988).³³

Thompson next published a report on the regulation of the halibut fishery (Anonymous, 1917; Thompson, 1917a). He directed much of his analysis to the U.S. Senate Bill 4586 of 1916 that would have imposed some regulations on the halibut fishery. Thompson argued that the 2-month winter closed period for

³¹ Arthur Willey was a Professor of Zoology at McGill University in Montreal, Canada (Cattell and Cattell, 1938).

³² Thompson had only a summary of Willey's paper at that time, but he was disturbed by the conclusions it contained. He described it as "... obviously simply a review of the literature of the subject and an attempt to advance certain surmises as to the life history of the halibut." Thompson to Babcock, dated Stanford, 24 February 1915. Photocopy in University of Washington Archives, Accession Number 2597-77-1, Box 1, Folder 51.

³³ Additional information on the political background of the various treaties proposed to regulate the Pacific halibut is given by Bell (1981) and Gilbert (1988).



Figure 5.—William F. Thompson (left) aboard the vessel *James Carruthers*, 1914. Source: William F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington, Seattle.

halibut as called for by the U.S. Senate might well result in more intensive fishing the remainder of the year, possibly by a larger fleet. Fishing in the winter months was the least profitable for the fishermen and a closed period as proposed would not protect the spawning stock as asserted by the proponents of the closure. The Senate Bill, according to Thompson, provided protection for the fishing banks that showed the least need for such protection. The areas that needed protection were those in which halibut rarely had a chance to mature because of the harvest of the fishery. Thompson laid out recommendations for closed

areas and seasons based on more biological evidence than the U.S. Senate proposal.^{34, 35} An effective mechanism for

³⁴ Thompson was apparently asked by the Commission to develop a plan for future halibut research to be conducted by the Province. I was unable to locate such a request in the archives, but Thompson responded with a detailed outline that included studies of halibut early life history, hydrography, collecting adult halibut vital statistics, and determining adult distribution. See Thompson to McIntyre, dated Victoria, 6 January 1916. University of Washington Archives, Accession Number 2597-77-1, Box 12, Folder 4; and D. W. McIntyre to Thompson, dated Victoria, 1 February 1916. University of Washington Archives, Accession Number 2597-77-1, Box 12, Folder 5.

³⁵ See next page for Footnote 35.



Figure 6.—Landing fish at National Independent Fish Company, Seattle, 7 July 1915. Source: William F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington, Seattle.

³⁵ Thompson was also asked to comment on the Canadian Government's draft regulations for the halibut in response to the U.S. Senate Bill 4586. G. J. Desbarats, Deputy Minister of the Naval Service, Ottawa, Canada, to Thompson, dated Ottawa, 26 February 1917. Thompson responded with a 4-page letter and a 20-page summary of his recommendations for regulating the halibut

fishery. Thompson to Desbarats, dated Everett, Washington, 29 March 1917. Thompson later provided additional information on the "halibut problem" to Desbarats. Thompson to Desbarats, dated Stanford, 27 April 1917. Photocopies of all three letters are in University of Washington Archives, Accession Number 2597-77-1, Box 1, Folder 51.

regulating the halibut fishery was still several years away (Gilbert, 1988).

This work ended Thompson's studies of the halibut, at least for this initial period.³⁶ In the summer of 1916, Thompson was asked to undertake an investigation of the Pacific herring, *Clupea pallasi*.³⁷ This he did in his normally intensive manner and produced the first such work on herring outside of Europe (Thompson, 1917c).

Conclusions

The fishery research efforts of the Province of British Columbia were terminated in 1917 as World War I continued.³⁸ Political winds in British Columbia, at times hostile to "Americans" working in Canada, were also changing as the Liberal Party came to power to replace the Conservatives.³⁹ With his

³⁶ Thompson (1917b) also published an analysis of the fecundity of the halibut.

³⁷ Babcock to Thompson, dated Victoria, 15 June 1916: "After talking the matter over with Dr. Gilbert I think we will ask you to make a study of the herring as soon as you think that you can draw your halibut work to a conclusion." Thompson to Babcock, dated Stanford, 20 June 1916: "The study of the herring should be a very fruitful one and I will undertake it with great deal of pleasure, thanking you for the opportunity." Later in this letter Thompson indicated that he wished also to continue his analysis of the halibut data he had collected. Photocopies of both letters are present in the University of Washington Archives, Accession Number 2597-77-1, Box 1, Folder 51. See also Gilbert to Thompson, dated Victoria, 29 July 1916. "Mr. Babcock agrees with me that you would do well to take up the herring next winter, if all goes well." Photocopy in J. B. Thompson, manuscr. II:37 (see footnote 1).

³⁸ W. F. Thompson to J. B. Thompson, dated Vancouver, 28 September 1915. "Canada is much in earnest about the war." And "The papers make a great deal out of the British advances, each one being announced one day, in big headlines, elaborately reported the next two days, and then made the subject of special articles." J. B. Thompson, manuscr. II:41 (see footnote 1).

³⁹ From the beginning of his work in British Columbia, Thompson was concerned about the political situation in the Province: "I do not want to think of the situation at Victoria. There are signs of a rising prejudice against Americans, but I hope there will be nothing serious resulting from it." Thompson to J. B. Shands, dated Victoria, 1 March 1914. Photocopy in J. B. Thompson, manuscr. II:1 (see footnote 1). "The election was overwhelmingly against the government, and the Liberals have as overwhelming a majority as had the Conservatives." Thompson to J. B. Thompson enroute Victoria to Vancouver, dated 18 September 1916. Photocopy in J. B. Thompson, manuscr. II:38 (see footnote 1). "Mr. Babcock said the Liberals would come to power on the 15th

continued



Figure 7.—Fish Exchange, Seattle, 7 July 1915. Source: William F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington, Seattle.

job prospects shaky, Thompson decided to seek employment elsewhere. With the help of Gilbert and Babcock, he secured employment with the California Fish and Game Commission where he ultimately developed a major marine research program for that agency (Dunn, 2001b). It would be seven years before Thompson returned to the Pacific Northwest and to the study of the Pacific halibut.⁴⁰

³⁹ (continued) of October, and he estimated six months as the time it would take them to formulate plans and policies on their own. Mr. Babcock says he will not stay even if he is allowed to unless his superior officer—the Commissioner of Fisheries—is thoroughly satisfactory to him.” Thompson to J. B. Thompson, dated Vancouver, 1 October 1916. Thompson recounted three items that would have caused Babcock to resign, if they occurred. He indicated that “Any of these things means the cessation of my work.” Photocopy in J. B. Thompson, manuscr. II:45 (see footnote 1).

⁴⁰ Thompson was appointed Director of Investigations of the International Fisheries Commission in November, 1924 (Anonymous, 1924). His diary for this period documents his meeting with the Commissioners in Seattle and his acceptance of the new position. Files, International Pacific Halibut Commission, Seattle, Wash.

William Thompson, at a relatively young age, left a legacy of significant accomplishment in the newly developing field of fisheries science. He was among the first to apply a measure of abundance, catch-per-unit-of-effort, to the stocks of a North American fishery. Thompson was also among the first to document a decline in any fishery, anywhere. He established a baseline for the subsequent research on the Pacific halibut. During this early period in his career, Thompson acquired a reputation for diligent and intensive work, a strongly focused mind, and penchant for extreme accuracy in his biological measurement (Van Cleve, 1966). Thompson's reputation continued and led to a long and very productive career as the predominant fishery biologist of the Pacific Northwest.⁴¹

⁴¹ Smith (1994) provides further information on Thompson's accomplishments in fisheries research.

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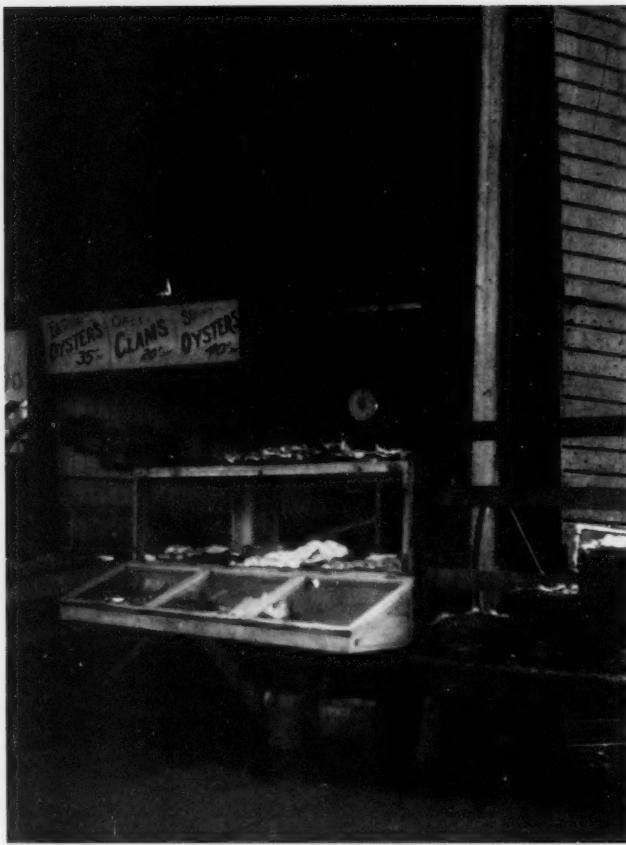


Figure 8.—Fish stall in Seattle, November 1915. Source: William F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington, Seattle.

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William Francis Thompson (1888–1965) and the Dawn of Marine Fisheries Research in California

J. RICHARD DUNN

Introduction

As concern increased in Canada over the consequences of World War I, the Province of British Columbia terminated fisheries research in 1917. William Francis Thompson (1888–1965), with the aid of Charles Henry Gilbert (1859–1928) and others, sought other work in

fisheries.^{1,2} With high recommendations from Gilbert, Thompson was hired to a temporary position in 1917 by the California Fish and Game Commission.^{3,4} Thompson then became important in the burgeoning field of marine fisheries research in California. By the time Thompson left California some

eight years later, he had established the commission's first marine fisheries laboratory and was instrumental in creating one of the finest state fisheries agencies in the nation (Bryant, 1921, 1924; Dunn, 2001a, b).

This article concerns Thompson's efforts to usher in marine fisheries research in California from 1917 to 1925. He initiated research programs first on the albacore tuna, *Thunnus alalunga*, and then on the Pacific sardine, *Sardinops sagax*. It was during his California period that Thompson developed his research approach of studying the fisheries directly, rather than studying the environment (Kendall and Duker, 1998). Thompson helped found and then directed the commission's first marine fisheries research laboratory. He was responsible for hiring a staff of scientists, many of whom subsequently became renowned for their work in fisheries research. This was also a period when Thompson became cognizant of the politics of the commercial fishing industry as well as the political aspects of working for a government organization. He was responsible for hiring a staff of scientists, many of whom subsequently became renowned for their work in fisheries research. This was also a period when Thompson became cognizant of the politics of the commercial fishing industry as well as the political aspects of working for a government organization.

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ABSTRACT—William Francis Thompson (1888–1965), an early fishery biologist, joined the California Fish and Game Commission in 1917 with a mandate to investigate the marine fisheries of the state. He initiated studies on the albacore tuna, *Thunnus alalunga*, and the Pacific sardine, *Sardinops sagax*, as well as studies on other economically important marine organisms. Thompson built up a staff of fishery scientists, many of whom later attained considerable renown in their field, and he helped develop, and then direct, the commission's first marine fisheries laboratory. During his tenure in California, he developed a personal philosophy of research that he outlined in several publications. Thompson based his approach on the yield-based analysis of the fisheries as opposed to large-scale environmental studies. He left the state agency in 1925 to direct the newly formed International Fisheries Commission (now the International Pacific Halibut Commission). William Thompson became a major figure in fisheries research in the United States, and particularly in the Pacific Northwest and Alaska, during the first half of the 20th century.

¹ Biographical data on Thompson are contained in an unpublished family memoir, "Thompson: a family history," compiled by his wife, Julia Bell (1884–1976), between ca 1925–1972: A copy of this manuscr. has been deposited in the W. F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington. Referred to here as J. B. Thompson, manuscr., unpaginated, but ca 372 p. (The volume and page numbers used here are those that I have added to my personal photocopy of this manuscr.; the original is variously paginated.) Thompson registered for the military draft but was not called to duty because he was married with dependents (a wife and a young son). See Notice to Call and Appear for Physical Examination, Local Board for Division No. 1, County of Los Angeles, dated 11 August 1917; Certificate of Discharge from Military Service, Local Board for Division No. 1, County of Los Angeles, dated 22 October 1917. Archives, School of Aquatic and Fishery Sciences, Thompson papers, Box 9, Folder 2.

² Presumably John Babcock aided Thompson's entry into the commission.

³ Carl Westerfield, Executive Officer, State of California, Fish and Game Commission to Thompson, dated San Francisco, 21 February 1917. "We are very desirous to obtain some one to take charge of investigation work in Southern California connected with the commercial fisheries there and hereby tender you this position, which will carry with it a salary of One Hundred Fifty (\$150) Dollars per month. We do not at present know how long this work will be continued, but can guarantee that your employment will last at least a year." Archives, School of Aquatic and Fishery Sciences, Thompson papers, Box 9, Folder 2.

⁴ Thompson to Fish and Game Commission, dated San Francisco, 21 February 1917. "In reply to your letter tendering me employment with the Fish and Game Commission, I would state that the conditions mentioned are perfectly satisfactory." Archives, School of Aquatic and Fishery Sciences, Thompson papers, Box 9, Folder 2.

This paper is based primarily on Thompson's published work and his personal papers in the archives of the University of Washington Libraries and the archives of the School of Aquatic and Fishery Sciences (U.W.), Seattle, Wash. Other sources consulted include the Stanford University Libraries, Stanford, Calif., and the files of the Inter-

national Pacific Halibut Commission, Seattle.

Thompson at the California Fish and Game Commission

Thompson was hired in 1917 by Norman Bishop Scofield (1869–1958), the Director of the recently formed Department of Commercial Fisheries in the California Fish and Game Commission (Clark, 1982; Smith, 1994).⁵ Thompson began work on 1 June in Long Beach, California, with a mandate to investigate commercially important marine fishes (Scofield, 1918).^{6,7} The albacore tuna was the object of initial studies by Thompson (Scofield, 1917d). The oceanside residence used as his office

was called initially the Long Beach Laboratory and later the California State Fisheries Laboratory. Thompson was in charge of the "Laboratory."⁸

The California tuna pack (mostly albacore) in 1916 was the largest on record. Nearly a half-million cans were processed, exceeding the sardine production by a factor of two. Some 397 fishing boats were employed in the tuna fishery, mainly off southern California. There were reports, however, that the abundance of albacore was less than it was the previous year (Scofield, 1917a, b).

In the early part of the 20th century certain prestigious scientists argued that because of their high fecundity it was impossible for many marine fishes to be overfished (Fig. 1–4).⁹ Thompson knew better, based on his experience with the Pacific halibut. The potential problem of albacore overharvest was one of the first questions Thompson encountered in his new work (Thompson, 1919b). He understood, however, that "proof" of overharvest would have to be demonstrated again and again for each fishery (Thompson, 1922a).

Thompson began his work on the albacore. A fishery data collection method, called the "pink ticket" system, was established in 1915 by the state legislature (Anonymous, 1918a; Scofield, 1918).¹⁰ These statistics provided the basis for assessing the status of the major commercial fishery stocks by the commission. Thompson began an analysis of albacore catch records, combined with data collected on size, etc.¹¹ Investigations of the albacore of various intensity continued through the

⁵ Norman Scofield was considered by some California scientists of the era to be the "father" of marine fisheries research in California (Clark, 1982). He was a member of the first graduating class of Stanford University in 1895. Scofield earned an M.A. degree in zoology from that institution in 1897 while studying under Professor Charles H. Gilbert (Anonymous, 1919c; personal communication, 8 June 2001, from Mark R. Jennings, 33913 Sharon Avenue, Davis, Calif. 95616–9456). Norman Scofield directed marine research for the State of California for 42 years (Croker, 1959).

⁶ Norman Scofield helped steer new legislation through the California legislature that levied a tax on all fish purchased by fish dealers. In addition to requiring a license for anyone catching or selling fish, the legislation assessed a "privilege tax" of 2 1/2 cents per hundred pounds of fish. This tax provided a continuing source of funding for the new Department of Commercial Fisheries (Scofield, 1917c; Thompson, 1924a; Clark, 1982).

⁷ Stanford University during the early 20th century was the center of ichthyology and of the emerging field of fisheries biology in North America (e.g., Brittan, 1997). During this time, zoology professors from Stanford University were frequently hired to conduct research for the commission. For example, Pacific salmon, *Oncorhynchus* spp., studies were conducted in 1911 by Charles H. Gilbert (later conducted by John Otterbien Snyder, 1867–1943), clam studies (razor clams, *Siliqua alta*, and other spp.) were undertaken by Frank Walter Weymouth (1884–1963), native oyster, *Ostrea conchaphila*, research was pursued in 1920 by Harold Heath (1868–1951), and taxonomic work on various families of marine fishes was directed by Edwin C. Starks between about 1915 and 1920 (Bryant, 1921, 1924). Thompson also hired Stanford faculty to investigate fisheries problems. For example, he hired Weymouth to study Pismo clams, *Tivela stultorum*, during April–June 1919 (Thompson, 1919c). Weymouth became Thompson's Ph.D. advisor after Charles Gilbert's death in 1928 and Thompson completed his doctorate under Weymouth in 1930 (Anonymous, 1931). One of the first definitions of fishery biology was written by Elmer Higgins (1934).

⁸ In 1918 the department acquired a vessel for marine research that was aptly named the *Albacore* (Anonymous, 1918b; Scofield, 1918).

⁹ For a historical review of the "overfishing" controversy, see Smith (1994).

¹⁰ The "pink-ticket" system required the fishermen to fill out a form listing the catch by species. The form consisted of three tickets, one for the fisherman, a pink copy for the commission, and a third copy for the dealer (Clark, 1982). Thompson described this data collection system "as one without parallel in any country, and it has already proved itself superior to any statistical system we are acquainted with" (Thompson, 1920b). For background information on the "pink-ticket system" and the law enabling the collection of commercial fisheries data, see Scofield (1918) and Thompson (1924a).

eight years of Thompson's regime and thereafter.

Thompson never published a comprehensive report on his albacore investigation, but, in a 1924 progress report, he noted that while overharvest might have been occurring he found no evidence of depletion.¹² He advised caution, recommending that conservation was advisable. He further indicated that progress had been made in accumulating knowledge of the age and growth of this species and that albacore appeared to be sensitive to physical conditions.¹³ Thompson indicated that his laboratory was studying the variability of the numerical strength of incoming age classes of albacore entering the fishery. Finally, he concluded that work was needed to determine the distribution and spawning areas of the albacore. He indicated that both of these investigations would be expensive, each requiring the use of a research vessel (Thompson, 1924c).

Thompson also began to hire scientific assistants to assist in his investigation of the albacore. Following a pattern that continued throughout his career, he hired talented biologists who subsequently became leading figures in fisheries science (Fig. 5–7). The first biologist hired by Thompson was Elmer Higgins (1892–1977). Other people

¹¹ In 1919 the commission announced plans for a new biological laboratory that was ultimately located in San Pedro, Calif. (Anonymous, 1919a; Scofield, 1921). Thompson undertook the planning of the new laboratory that was occupied in October 1921. He was appointed the laboratory director (Anonymous, 1919b; Thompson, 1921b). Thompson, with his wife Julia, also published in 1919 a pioneering study of the spawning behavior of the California grunion, *Leuresthes tenuis* (Thompson and Thompson, 1919). In his published papers, Thompson frequently acknowledged the help of his wife (e.g. Thompson, 1919b).

¹² "The report upon the albacore, which has been for some time in the final stages, has not been completed for publication, and it is not at present writing, known how soon the writer can resume work upon it" (Thompson, 1924c). This statement was likely written after he had accepted his new position with the International Fisheries Commission (see footnote 30).

¹³ The albacore fishery collapsed in the 1930's, apparently because warmer ocean waters caused the albacore to migrate north to cooler waters. The prevalence of warmer waters off southern California lasted from about 1926 to 1941. For more on the history of the fishery and the biology of albacore tuna, see Clemens and Craig (1965).



Figure 1.—One day's catch of tuna and similar fish at the cannery of the International Packing Corporation at San Diego, California (n.d., but ca 1917–18). From Thompson (1919e).

Thompson hired early in his California tenure included Oscar Elton Sette (1900–1972), a student at Stanford University, who was stationed at San Pedro to collect measurements and other statistics on albacore. Later employees (mostly Stanford University graduates) who also became leaders in fisheries science and administration included Francis Naomi Clark (1894–1987); Harlan Banta Holmes (1898–1975); William Launce Scofield (1886–1966), a younger brother of Norman Scofield; and William Charles Herrington (1903–1989) (Thompson, 1921c, e).¹⁴

¹⁴ Elmer Higgins, whose background was relatively unusual in that he was a graduate of the University of Southern California, moved from the state agency to the U.S. Bureau of Fisheries in 1924 where he served in various capacities, including director of the Key West Biological Station in Florida. Later he was assistant to the Director of the Bureau (Cattell, 1955).

Oscar Sette, who preferred to be addressed by his middle name, Elton, became a prominent figure in fisheries science in both the Atlantic and Pacific regions and he later became a leader in Federal studies on the Pacific sardine (Cattell, 1955; Powell, 1972; Kendall and Duker, 1998).

Frances Clark was the first female biologist to be employed by the California Fish and Game Commission. She spent most of her career with the state agency, rising to become Director of the State Fisheries Laboratory and a major figure in Pacific sardine research (Clark, 1982; Croker, 1987).

Harlan Holmes left the commission in 1922 to join the U.S. Bureau of Fisheries. He spent the remainder of his career with the Federal agency, stationed in the Pacific Northwest, and became a well-known figure in salmon research on the Columbia River (Cattell, 1955).

William Scofield spent 37 years with the California Department of Fish and Game. He became director of the California State Fisheries Laboratory in 1925, upon Thompson's departure from the state agency. He served as laboratory director for nearly 17 years and was particularly noted for his knowledge of the fishing industry (Roedel, 1967).

William Herrington left the state agency to join Thompson at the International Fisheries Commission where he stayed from 1927 to 1930. He then worked for the U.S. Bureau of Fisheries from 1930 to 1947 and later (from 1951 to 1966) *continued*



Figure 2.—California sardine catches, 1917. Source: William F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington, Seattle.

Finding trained technical help was a continuing problem that worried Thompson. Many of his assistants were graduate students (mainly at Stanford University) who would work for some time before returning to school to continue their graduate work. The shortage of these kinds of people caused Thompson to hire undergraduate students, "no graduates being available" (Thompson, 1924b).

Thompson was able to identify those fishery resources most in need of scientific attention. He listed six kinds of commercial marine fishes and invertebrates

being studied by his laboratory: albacore; Pacific sardine; California grunion, *Leuresthes tenuis*; clams (mainly the Pismo clam, *Tivela stultorum*); Pacific herring, *Clupea pallasi*; and California halibut, *Paralichthys californicus* (Thompson, 1924a). The species primarily in need of research, however, was the Pacific sardine (Thompson, 1919b, 1920a).

Based on his experience with the Pacific halibut in British Columbia, Thompson (1924a) emphasized the necessity of conservation, a theme he was to revisit in subsequent years:

"The general and marked depletion of migratory fishes such as the salmon, together with that of our Pacific coast halibut, and the plain overfishing of various species in the waters of the North Sea, have been real object lessons to fishery men.

Our program is, because of such reasons, based on the necessity of conservation and upon the need for governmental vigilance to permit the free expansion of the fisheries.

It requires, because of its nature, the support of farseeing and unselfish men."

About this time, the harvest of the Pacific sardine in California coastal waters was beginning to increase dramatically, from about 27,500 tons¹⁵ in 1916–17 to over 173,000 tons in 1924–25. Although this level of harvest was relatively small compared to later harvest (over 725,000 tons off California in 1936–37), some biologists were becoming fearful of depletion (Radovich, 1982).¹⁶ Thompson

¹⁴ (continued) was the U.S. State Department Fishery Attaché to Japan (Anonymous, 1971). See also the Thompson diary for 1924–25, black leather 3-ring binder, about 18 by 26-centimeters, listing Herrington as an employee. Only diary entries for 24 November 1924–February 1925 are present in the files of the International Pacific Halibut Commission.

¹⁵ Harvests in that era were listed in U.S. tons (2,000 lb.), not metric tons.

¹⁶ See the next page for Footnote 16.



Figure 3.—Sardines drying in the sun, Monterey, Calif., ca 1917. Source: William F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington, Seattle.

turned his attention to this burgeoning resource (Thompson, 1920a; Thompson and Higgins, 1920).

Thompson developed a research plan for the Pacific sardine. In an article targeted for a general audience, he outlined the questions that needed to be answered to determine the status of the sardine stocks and how the commission would answer those questions (Thompson, 1920a).^{17,18} He indicated that his group would be collecting the appropriate data needed to assess the sardine populations.

Elmer Higgins was stationed in San Pedro, Calif., and Elton Sette was transferred from San Pedro to Monterey, Calif., to collect sardine catch data.

¹⁶ The sardine fishery reached its apogee in 1936–37, only to collapse in the early 1950's (Radovich, 1982).

¹⁷ Thompson's (1919b) article on the "proposed investigation of the sardine" centered on five questions: "1) Will depletion occur?; 2) Are there great natural fluctuations in abundance, or quality, other than those of depletion?; 3) Is it possible to foretell fluctuations?; 4) Do sardines migrate from one region to another?; and 5) If depletion should occur, what measures for protection should be adopted? He described the kinds of data needed to answer these questions, and for the sardine he wanted: 1) Commercial catch of sardines by vessel type, gear, and fish-



Figure 4.—White Star Canning Company, San Pedro, Calif., 1919. Source: William F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington, Seattle.

ing area; 2) Composition in and variation of catch by size and age; 3) Spawning season and areas; 4) Yearly abundance of young sardines and knowledge of their early life history; and 5) Age and rate of growth as well as knowledge of the "racial" differences of stocks, if any (Thompson, 1919b).

¹⁸ Thompson described his research plans in various issue of the commission's quarterly publication, but most often he directed his writing toward a lay audience (e.g. Thompson, 1920a, 1921a, b). He also published a more scholarly description of his methods of fisheries research (Thompson, 1919b).

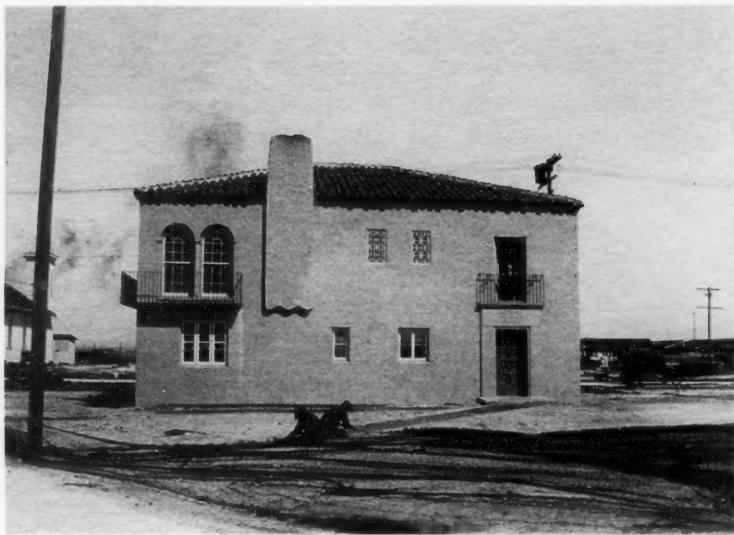


Figure 5.—California State Fisheries Laboratory, February 1922. Source: William F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington, Seattle.

Thompson, aided by various others, oversaw the fieldwork and conducted much of the data analysis from his base in San Pedro (Thompson, 1920c). Higgins (1920) analyzed daily catch data obtained from the "pink tickets" of sardines caught on about 110 boats fishing in the San Pedro district. Data on length, average weight, sex, and degree of maturity were taken daily as vessels unloaded their catch. Higgins confirmed Thompson's (1919d) previous observations that sardines spawned in the spring.

Sette (1920) reported that the fishery in the Monterey Bay district had increased in volume by a factor of eight over the catches just three years previously. He began his study in the summer of 1919 and the data collected in the Monterey area paralleled those collected by Higgins at San Pedro. Sette was granted laboratory space at the Hopkins Marine Station, a facility of Stanford University, where he began the analysis of catch data.¹⁹

¹⁹ Thompson recorded in the Thompson family history a humorous episode in 1917 that apparently plagued his early scientific group as they began their statistical analysis of data. He wrote:

continued

Thompson (1921a) noted that in 1920 the sardine accounted for about 85 percent of the commercial harvest of fishes in California. In a portent of the future, he wrote "Will the sardine remain, or will it vanish at times as does its cousin the herring of the North Atlantic, and as the sardine itself probably does in British Columbia and Alaska?" That question would be answered in the 1950's as the sardine disappeared (Radovich, 1982).²⁰

As he was to do later for the Pacific halibut, Thompson described the history of the sardine industry, tracing its origin

¹⁹ (continued) "But unfortunately we had at that time no adding machines or calculators or tabulating systems, and were seemingly unable to convince the Sacramento authorities that they were needed. We received an answer to our request for an adding machine, an inquiry as to why a biologist needed such a machine! My wife and I, and later helpers, tried valiantly to add our figures mentally from tables copied in longhand; we ended with what seems to me a confused mess of personal notes and memoranda which made no sense at all as a report. We did not succeed in setting this in order because of deep involvement in sardine problems and my move in 1924 to Seattle to direct the new International Halibut Commission" (Thompson, J. B. manuscr. III: 72, see footnote 1).

²⁰ For a review of the early history of applied fisheries research as well as Thompson's role in it, see Kendall and Duker (1998).

in California to about 1890 (Thompson, 1921d). He considered the industry as a product of World War I, with growth of the fishery in California due to the cessation of foreign imports and, later, increased foreign demand.

In a summary of sardine research conducted by the state fisheries laboratory through 1924, Thompson stressed conservation and the avoidance of depletion of the sardine populations.²¹ He also emphasized the applied nature of his research, noting "that a rigid adherence to a practical end was insisted upon from each of the assistants" (Thompson, 1924c).

A volume of the commission's *Fish Bulletin*, containing five papers devoted to the Laboratory's sardine research, was published in 1926, after Thompson left state employment. Thompson's final two papers concerning the sardine were published in that volume. The first report was a review and analysis of the sardine work completed during Thompson's tenure in California. With a thoroughness that was to characterize Thompson's work, this report reviewed the available knowledge on sardines. He analyzed the morphology of the sardine and compared it with its European counterpart, reviewed the commercial catch of sardines on the Pacific coast and compared it to the fluctuations in catches of the European sardines, analyzed the sardine catch off California, and reviewed the methods used to study the abundance of the species. He introduced "catch-per-unit-of-effort," defining catch as "the catch of a unit of gear, or equipment, fished with normal skill and without hindrances for a given time." Thompson further noted that this measurement was "capable of very considerable refinement." Among his conclusions, Thompson noted "that the discovery of overfishing must take many more years than were thought at first" (Thompson, 1926a).

In the second paper published in this volume, Thompson reviewed the difficult sampling problems inherent in data collection on sardines. He discussed the

²¹ Emphasizing the goal of "conservation," Thompson (1924c) wrote "as is made very clear in the law under which we work and in our published papers, the conservation of our fisheries must be set above all else."

concept of "dominance" and the understanding of the catch, the significance, interpretation, and use of the mode, as well as the problem of statistical errors and the difficulties of sampling. Thompson noted the numerous uncertainties surrounding the sampling of the sardine catch. He acknowledged the need to "weight" each sample by the amount of the commercial catch it represented. Thompson felt that the time for, and knowledge of, such weighting had not yet arrived (Thompson, 1926b).

In the same volume, Sette presented the results of his studies of problems in sampling the sardine. He suggested that sampling the commercial catch twice a week was necessary to obtain a portrait of the year's catch (Sette, 1926). Higgins described the fluctuations in the sardine fishery at San Pedro. He noted the marked changes in sardine catches from year to year and he described the length variability of the samples. He found that there may be extended periods in which spawning is relatively unsuccessful. Higgins also found a good correlation between the sizes of sardines captured with the numbers of fish packed in oval tins. Such a correlation offered a method of estimating the catch during the fishing season (Higgins, 1926). William Scofield (1926) described the progression of size classes of sardines in Monterey and the fluctuations in abundance within and between years; he too found a correlation between the length composition of sardines and the numbers of fish packed in oval tins.

The Development of Thompson's Philosophy of Fisheries Research

During his California days, Thompson was developing his own philosophy about marine fisheries research, and he saw the need to disseminate his thoughts to a general audience. His previous experience in British Columbia had taught him the benefits of communication with the fisherman and the processor. He published several general articles describing the work conducted by the state fisheries laboratory and the value of fishery research (Thompson, 1919a; 1920a,b; 1921a; 1924a). Reaching out to a wider audience became a Thomp-

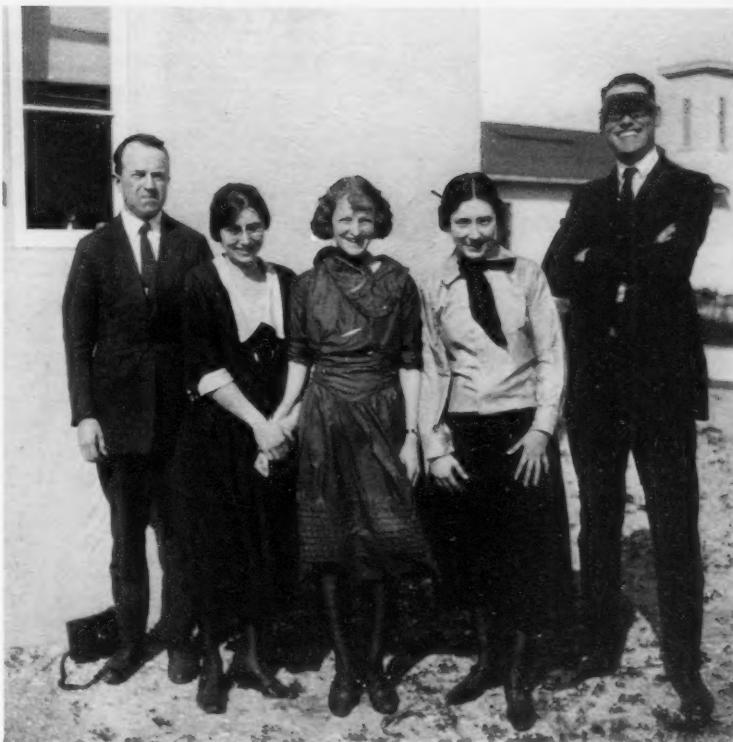


Figure 6.—Staff of the California State Fisheries Laboratory, April 1923. From left to right: Thompson, Frances N. Clark, Miss Anderson, Miss Stewart, and Elmer Higgins. Source: William F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington, Seattle.



Figure 7.—California Fish and Game Commission research vessel *Albacore*, San Pedro, California, 1919. Source: William F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington, Seattle.

son trademark throughout his professional career.²²

Thompson's philosophy of "pragmatic applied research" was elucidated in some of his publications (Thompson, 1919b; 1921d; 1922b; 1924a).

"That the primary purpose of the investigations of the California Fish and Game Commission are conservation and adequate utilization has been stated many times. But such purposes have been repeatedly avowed by investigators, whose programs when adopted have betrayed a primary interest in natural history, and have shown little relationship to the problems to be solved. The scientific program of the Commission has, however, been planned very specifically to meet the problems which are involved in government control of the fisheries, and are adapted to meet the responsibilities of the state as legal guardian of those natural resources" (Thompson, 1920b).

He further defined his approach in a subsequent paper. Referring to the extensive research conducted in the North Sea by various countries and the limited resources of the state, Thompson (1922a) wrote:

"It soon became evident that it was impossible for the State of California to undertake the many lines of general inquiry into the varying conditions of the sea and its life that had been investigated more or less by those European countries. That would have been tunneling the mountain by removing it in its entirety. It was necessary for the state to limit its efforts to those fields which had been shown to bear directly on the ascertainment

of the condition of the fisheries, namely, the measurement of the variance in abundance of the fishes in the sea, the effects of fishing upon it and the biological criteria of overfishing. A careful perusal of much of the hydrographic and planktonic work demonstrated its remoteness from the work in hand despite its undoubtedly great ultimate value, and showed that most of the immediate questions could be solved to the required degree without their aid. There were necessary certain biological studies upon the fishes themselves, but above all a statistical study of the fisheries and the fish."

Thompson therefore advocated a rather narrow view of fishery research, focusing on the fishery rather than the environment. His belief was that stock abundance could most efficiently be determined from commercial fishery catch rates. He felt this method was a pragmatic and cost effective approach to fishery research that resulted in the information needed for rational management of a fishery.

Epilogue

The nation and the State of California underwent an economic recession in the aftermath of World War I (Abell et al., 1955). This caused a retrenchment in state funding of fisheries research in California and resulted in cuts in the budget for Thompson's laboratory. There was a movement by the state government in 1923 to delete funding for the California State Fisheries Laboratory.²³ The laboratory survived, but with a reduced scope

²² "It seems to me as though I must (original emphasis) popularize my work and place the facts in easily accessible articles. Indeed as I think it over, that seems the greatest single thing to be done, and the factor which seems least attended to." Thompson to J. B. Thompson, dated Stanford University 1 June 1915 (Thompson, J.B. [Editor]. MS. II:8-9, see footnote 1).

of research.²⁴ Low pay for biologists, coupled with the political uncertainty, led several of Thompson's employees to leave state employment.²⁵ Thompson worried about the viability of fishery research in a political climate^{26, 27, 28}, and he also wondered about his future.²⁹

²⁴ Apparently due to budget restrictions, research in the 1924-1926 biennium was confined mainly to the sardine and northern anchovy, *Engraulis mordax*, instead of the 8-10 species studied in previous years (W. Scofield, 1927).

²⁵ Thompson (1924c) noted in the commission's Biennial Report for 1922-24 that, of the scientific assistants he had hired, "All of these assistants, with the exception of Mr. W. L. Scofield, have, however, now left the Commission, either for the service of the Federal Bureau of Fisheries or for work at universities. It has become very apparent that the retention of these assistants when fully trained will require a higher standard of salary and greater provision for permanency of employment that at present offers, since there is very obviously a shortage of such men in the United States." Some of those who left acquired prestigious positions. For example, Sette and Higgins each took jobs as division chiefs for the U.S. Bureau of Fisheries in Washington, D.C. (Anonymous, 1926).

²⁶ In one of his last reports for the commission, Thompson recommended that the state fisheries laboratory be removed from the uncertainties of state funding and politics. He recommended the establishment of a legal foundation "for the formal organization of the laboratory, the formation of a cooperative agreement with the U.S. Bureau of Fisheries, and the creation of an advisory committee or board to keep a general supervision of the scientific work" (Thompson, 1924c).

²⁷ During the period of financial hardship for the state fisheries laboratory, a cooperative agreement was reached between the commission and the U.S. Bureau of Fisheries. In the agreement, the Federal agency agreed to pay \$2,000 per annum to help pay the salaries of two employees of the state fisheries laboratory. According to the agreement, one state employee was to work on fishery investigations and the other was to be assigned to pursue fishery statistics. Presumably Thompson negotiated the contract in that the letter of agreement between the two agencies was addressed to Thompson from Henry O'Malley, Commissioner of the U.S. Bureau of Fisheries (letter reproduced by Thompson, 1924c). O'Malley (1876-1936), who was a "Field Agent" for the Bureau in 1918-21 and headquartered in Seattle, was appointed director of the agency in 1922 and served in that capacity until 1933 (Anonymous, 1943).

²⁸ As an example of how the agreement with the Bureau of Fisheries worked, Thompson's diary for 1924-25 noted that Herrington's salary (n.d., but presumably for 1925) was to be \$70 a month from the state and \$80 per month from the U.S. Bureau of Fisheries. W. F. Thompson diary for 1924-25, files of the International Pacific Halibut Commission (see footnote 14).

²⁹ In 1923 Thompson wrote to Norman Scofield complaining about the lack of resources and the loss of his prized employees. Thompson to continued

About this time Thompson was offered the position of Director of Investigations for the newly formed International Fisheries Commission established to regulate and restore the Pacific halibut fishery. Thompson accepted the job, moved to Seattle, Wash., and joined the new Commission in February 1925, thus ending the California phase of his career (Scofield, 1925; Thompson, 1926c).^{30,31} With the International Fisheries Commission he was to forge the next step of his career as a fishery scientist.

During his tenure in California, Thompson laid the foundations for a strong marine research program for the state agency. His emphasis was on the collection of "vital statistics" of the fishery (Thompson, 1919b). He published over 55 papers during this period, many of them rather general papers directed toward the lay public. Other articles he published were definitive studies that set the standard of the era. California became noted for the quality of its marine fisheries research and for Thompson's development of yield-based analysis for managing fisheries (Scheiber, 1994).

In particular, Thompson's approach to investigating the abundance of the sardine utilizing yield-based statistics was

in stark contrast to the wide-scale environmental studies (or fisheries-oceanography) conducted later by the California Cooperative Fisheries Investigations (CalCOFI) to assess the abundance of the sardine (Scheiber, 1994; Kendall and Duker, 1998). Thompson continued this approach in his subsequent work at the International Fisheries Commission, and he strongly influenced later generations of fishery scientists.³²

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²⁹ (continued) N. B. Scofield dated San Pedro, 9 August 1923 in Thompson papers, University of Washington Archives, Accession Number 2597-77-1, Box 12, Folder 11. He also sought the counsel of Gilbert concerning the political uncertainty in the state agency. Thompson to Gilbert, dated San Pedro, 21 June 1923, Thompson papers, University of Washington Archives, Accession Number 2597-77-1, Box 12, Folder 12.

³⁰ Among the commissioners who likely made the choice for the new director was John Babcock (Anonymous, 1924). Norman Scofield was one of the first biologists appointed to the Commission's "scientific advisory committee" (Anonymous, 1926). Thompson initially worked for the International Fisheries Commission while "on leave" from the California Fish and Game Commission. He returned to California at intervals to continue his work there (W. Scofield, 1927). Thompson's diary for 1924 briefly describes his trip from California to Seattle to interview for the position with the International Fisheries Commission. He was hired on 24 November 1924. William F. Thompson diary for 1924 (see footnote 14). Files, International Pacific Halibut Commission, Seattle, Wash.

³¹ Norman Scofield (1925) announced Thompson's move to the new International Fisheries Commission: "Mr. Thompson proposes to adopt the same common-sense method of statistical observation which has been utilized in California and to interpret and support the statistical evidence by biological research."

³² Thompson's approach to research was not without later criticism. A summary of some of the controversy about Thompson's research methods is given by Smith (1994).

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The *Marine Fisheries Review* publishes review articles, original research reports, significant progress reports, technical notes, and news articles on fisheries science, engineering, and economics, commercial and recreational fisheries, marine mammal studies, aquaculture, and U.S. and foreign fisheries developments. Emphasis, however, is on in-depth review articles and practical or applied aspects of marine fisheries rather than pure research.

Preferred paper length ranges from 4 to 12 printed pages (about 10-40 manuscript pages), although shorter and longer papers are sometimes accepted. Papers are normally printed within 4-6 months of acceptance. Publication is hastened when manuscripts conform to the following recommended guidelines.

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Submission of a manuscript to *Marine Fisheries Review* implies that the manuscript is the author's own work, has not been submitted for publication elsewhere, and is ready for publication as submitted. Commerce Department personnel should submit papers under a completed NOAA Form 25-700.

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Keep titles, heading, subheadings, and the abstract short and clear. Abstracts should be short (one-half page or less) and

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In style, the *Marine Fisheries Review* follows the "U.S. Government Printing Office Style Manual." Fish names follow the American Fisheries Society's Special Publication No. 12, "A List of Common and Scientific Names of Fishes from the United States and Canada," fourth edition, 1980. The "Merriam-Webster Third New International Dictionary" is used as the authority for correct spelling and word division. Only journal titles and scientific names (genera and species) should be italicized (underscored). Dates should be written as 3 November 1976. In text, literature is cited as Lynn and Reid (1968) or as (Lynn and Reid, 1968). Common abbreviations and symbols such as mm, m, g, ml, mg, and °C (without periods) may be used with numerals. Measurements are preferred in metric units; other equivalent units (i.e., fathoms, °F) may also be listed in parentheses.

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